

ART. V.—Notes on *Malurus gouldii* and *Malurus cyaneus*,
with special reference to changes in plumage.

By ROBERT HALL.

[Read 11th May, 1899.]

To identify the two species with which this paper deals, a key is given by Dr. Sharpe in vol. iv. of the Brit. Mus. Cat. Birds. which, on carefully comparing with many specimens in my cabinet, I find is particularly useful as regards the characters of the blue coloring; but the various measurements seem to differ so much in some thirty skins I have handled, that the key to the species seem to me to be the nature of the blue color of the male bird.

The British Museum keys are:—

Malurus cyaneus, Ellis.—Head, blue; throat, blue-black; upper tail coverts black, smaller than *M. gouldii*; wing, 1.95"; head, ear-coverts and mantle turquoise blue.

Malurus gouldii, Sharpe.—Head, blue; no red on upper surface; throat, blue-black; upper tail coverts, black; larger than *cyaneus*; wing, 2.15"; head, ear-coverts and mantle rich cobalt-blue; mantle more extended than in *M. cyaneus*.

Taking first the difference in the length of wing I cannot see the character is sufficiently strong as a leading one to constitute a part of a basis for us to identify the species. Of mature birds the wings measure:—

M. cyaneus.

a. - - - 1.9".
b. c. d. - 1.95".
e. f. - - - 2".
g. - - - 2.2".
Range from 1.9" to 2.2".

M. gouldii.

a. b. c. d. - 2".
e. f. - - - 2.05".
g. - - - 2.1".
h. - - - 2.15".
Range from 2" to 2.15".

In the mantles I see no regular comparative difference in the measurements. Adult birds (*M. cyaneus*), from the same paddock in county Evelyn, and adult birds (*M. gouldii*) from the same locality in county Heytesbury (150 miles apart), give depth of mantle $\cdot 4''$ to $\cdot 75''$, and the mantle varies in how near the centre of the throat it may approach. I do not see any order in the extension of the mantle that severs the likeness in the two species.

M. gouldii, as a whole, in any stage does not seem to me to be larger than *M. cyaneus*, and I give, as under, some measurements of three stages of *M. cyaneus* that appear to correspond with equal stages of *M. gouldii*.

- A. ♂. Juv. 31/7/96, Box Hill, Vic.: Bill, chocolate-brown; tail, light blue; plumage generally brownish. Total length, $4\cdot 75''$; wing, $1\cdot 95''$; tail, $2\cdot 4''$; tarsus, $\cdot 85''$.
- B. ♂. Box Hill, Vic.: Under 12 months, 4/8/94. Total length, $4\cdot 75''$; wing, $2''$; tail, $2\cdot 5''$; tarsus, $\cdot 9''$.
- C. ♂. ad. 18/9/94, Box Hill, Vic.: In full nuptial plumage. Total length, $5\cdot 75''$; wing, $2\cdot 2''$; tail, $2\cdot 6''$; tarsus, $\cdot 85''$.

The distinct difference between the two lies in the head, ear, coverts and mantle of one being rich cobalt-blue, and turquoise in the other.

No previous literature with which I am acquainted makes any reference to a conspicuous greenish-blue on the secondary quills of either species. This seems to be quite right as concerns *M. cyaneus*, for in sixteen male birds in my cabinet, not one has this color on the edges of the outer webs of the secondary quills. In eleven specimens of *M. gouldii*, the most matured skins have this character varying in intensity. Other naturalists may have skins of *M. cyaneus* showing this greenish-blue, but if not it will distinctly define the adult male of *M. gouldii*.

Wrens in their autumn plumage are confusing in the sexes, for, at this time of the year all are much alike, as will be conclusively proved further on. The young female is similar to the old female excepting in the tail, the latter being blue, the former brownish. The young male, as well as the old male, in the critical parts (moulting) of the year, are somewhat like each other, and like the female in the distance. The lores of the

young male are brownish which, in the old male, are black. In both young and old female they are rufous. The older the female the deeper the blue of the tail. In skins *a. b. c.*, collected on 4/8/94, 15/7/96, 1/11/96; the tails quills are brown. In a brown male shot 26/8/93, the bill and tail were like those of a female, but the lores were different. Young and old of both sexes in irregular dates of the autumn are alike, brownish, and this sombre attire of each sex, but for the lores, would, sometimes, confuse the observer with the best of field-glasses.

A. *Previous references.*

The late Mr. John Gould, while writing on the genus *Malurus*, in his "Handbook to the Birds of Australia," remarks:—"The gay attire is only assumed during the pairing season, and is retained for a very short time, after which the sexes are alike in coloring." Continuing, he says, "During the months of winter it associates in small troops of 6—8 in number, which continually traverse the district in which they were bred. At this period of the year the adult males throw off their fine livery, and the plumage of the sexes becomes so near alike that a minute examination is requisite to distinguish them."¹

"Relative to the above statements, that the males of the genus *Malurus* only assume their full plumage during the pairing season, and that the adult males throw off their fine livery in winter, and can hardly be distinguished from the females—Gould is decidedly in error." So writes Mr. A. J. North,² following on with some observations in justification. With the first part of Mr. Gould's theory I agree in part, and only so because all facts away from the main issue have not been recorded by this great ornithologist. I am well able to prove that the full livery is obtained in autumn as well as in spring in different specimens, though not to such an extent in the former as in the latter. With the second part of his observations I take exception only to his statement of the period of moult being winter instead of autumn principally. In all this I am opposed to the theory of Mr. North. I have observed the same as Mr. North as regards seeing full plumaged males at the end of May and monthly up to

¹ Gould. Handbook Birds of Australia, vol. i., pp. 317-18.

² P.L.S. N.S.W., vol. v., 2nd series, p. 505.

August, but the moult of blues takes place months before this, and the blues are in fresh supply again by the end of May and later (when birds are assuming blues in spring).

Mr. North quotes records given him by Mr. Geo. Masters and Mr. Geo. Barnard, with which I quite agree, but a reference to the skins as under will clearly show that the remarks of these gentlemen are not definite enough, for "winter" only is mentioned. Mr. North quotes facts and opinions of Mr. K. H. Bennett on the Maluri, and had this gentleman gone further in his research he would, in my opinion, have discovered the true state of affairs. Mr. North also quotes the opinion of Dr. Ramsay, that, in the section of the genus in which the blue predominates, the males having once attained their full adult plumage always retain it; but does not feel quite so certain about the members of the red-backed species.

Mr. J. R. McClymont¹ also takes exception to Mr. Gould's "blue-birds" not being seen in winter, and here this gentlemen also stays his hand.

Mr. F. G. Aflalo writes² of the Maluri, which he has watched throughout the winter months in the Sydney gardens, as only attaining the bright plumage during breeding season.

The late Mr. Diggles in his "Ornithology of Australia," speaks of the male of *M. longicaudus (gouldii)*, losing its bright plumage during the winter months. This, again, is only partly true, and I am not quite sure he knew the species, as both figure and letterpress are incorrect as regards the most important point, the blue—reversed in *M. cyaneus*, plate 27.

Mr. Belcher, in the "Geelong Naturalist," writes:—"Mr. Mulder has proved that the male does not attain its full plumage till the second or third year. Male birds of immature plumage have been found breeding."³ I will at once comment upon this. I understand the maturity referred to, to mean full blues on head, mantle and cheeks. If the male takes 2—3 years to attain its conspicuous plumage, why does it drop the same on the fourth and each succeeding year? I say the fourth and each succeeding

¹ Roy. Soc. Tas., 1887, p. 111.

² A sketch of the Natural History of Australia, p. 136.

³ Mr. J. F. Mulder communicates to me, 18/4/99, his doubt of the verity of this previous statement, but suggests no alteration.

year, because Mr. Graham and I have carefully tested two districts, in which *M. cyaneus* and *M. gouldii* are separately to be found, and we find 99% of the wrens are brown by the end of summer, the remaining 1% being "blue." Then, as to observing an immature bird going through the stage of rearing young, I have some doubt, because of the regular attention one brood of young gets from 2—3 adult males as mentioned in the part following on nidification. Such an immature bird could easily be one of these three. Besides, I do not believe a female wren would mate with a half liveried male. In the bird referred to below as that under domestication, the young male actually did assume half a blue dress in its first spring. It went no nearer to maturity, and moulted it in the following autumn.

I do not think there is throughout our continent a bird that has hoodwinked us more or has made more champions "for and against" an annual change in its life-history than the blue wren. Without doubt I consider the annual double moult of the male wren to be now an established fact as contended for by Mr. Gould in the first place, but in a fuller sense by the following original observations.

The species specially chosen by myself is *M. gouldii*, a representative of the blues, which I judge by analogy, will embrace a moult of the bright feathers in all the other "black-backed," if not the "red-backed" section as well.

B. *Birds at large.*

That the male moults its blue coat once in a year is proved in the following, not only by many specimens procured and preserved, but by a bird in captivity. That the male dons its "blue" either in autumn or spring I find demonstrated in the skins procured.

Moulting processes takes place in :—

A. "Blues" falling from late summer to the first of autumn.

B. "Browns" falling in (*b'*)—Early autumn.

(*b''*)—Spring.

In the autumn none but singing birds are affected, the young still holding their little chirps and their brownish bills and legs. I have skins of male birds developing their nuptial plumage in April, May, July, August, and on to Oct. 25th. The spring is the

time when the moult of brown is strong. As described later, one bird shews the acquisition of both "blues" and "browns" in March, as if a war was being carried on for the mastery. I consider the "browns" would have gained, though this skin still remains an oddity. The change of bill from brown to black appears to be a spring move, and according to the large number of moulting birds in March—April, the act evidently is confined to birds at least 15 months old, judging by the color of bills.

Adult males represented with their "blues" become scarce by early April, nevertheless they are easily detected while brown as leaders of families.

During the winter months it is not unusual to count ten—twelve birds, of which only one is in livery, or a group of five (*M. gouldii*) to six (*M. cyaneus*) ordinary brown birds foraging along a creek bank; but it is quite apart from the ordinary to count twenty-seven sombre colored birds (*M. cyaneus*), in one brake of thicket, with a possible three or four more. In June, 1897, I was favored with a sight of this large group of what our boys call the "blue-tit," when the leader flew away with nineteen as immediate followers in single file, and the remainder, feeling themselves disbanded, with very little hesitation, followed in pursuit of the first contingent. There were no blue birds! If there are no "blues" in a flock of twenty-seven would there be any in a district association of one hundred? This was the question I set Mr. Graham to unravel—which was answered satisfactorily. In the 1897 winter a thorough search was made through a portion of Heytesbury, with the result that 1 adult male in 100 brown birds could not easily be found. In 1898 this was modified to 1—100 birds. The ratio stands also for 1st April of this year. From this I conclude, as far as *M. gouldii* is concerned, that the bird which obtains its "blues" in autumn is in the ratio of 1 to 100 brown males and females, and 1 to 20 in males that don the "blues" in spring. If the nuptial plumage is put on during the late autumn, it is doubtless retained throughout the winter on to early in January, when precocious birds moult their blues as is shown in one skin in my cabinet.

With regard to the time necessary to a moult of "blues," Mr. Graham gave his most careful attention in set parts of each

Specimen 2.—Male (about 27 months old), 24/3/97. Browns are coming as well as have matured on the head, nape, cheeks and mantle. One large “blue” left in region of nape: no new “blues” on head or cheeks, but with some old ones remaining. Outer webs of secondary quills without any trace of greenish-blue; merely brown. Bill and feet jet black.

Specimen 3.—Male (approx. 2—3 years of age), 24/3/97. This skin is uniformly cloaked with the winter brown and with one “blue” on each cheek remaining. The brown feathers are well developed, new, or still coming, and in the lumbar region very long, as if prepared to resist the elements in a wet forest. Wing quills in process of moulting, and about midway in development. The spurious wings are maturing. Outer webs of wings have no trace of blue on them. Tail feathers in two stages; one set a quarter way on to maturity. Bill, black.

Specimen 4.—Adult male, nearly adult (approx. 3 years), 23/3/99. In accordance with the intensity of the purplish blue-black of the throat and chest feathers, the dense black of the line beneath the throat and around the neck, as well as the fairly deep-blue of the tail, this is the skin of a bird not in youth. As it has not the secondary quills edged with greenish-blue it is not a thoroughly aged bird, and I venture, by comparison, to put it down as one three years' old.

The brown feathers have mostly come upon the crown, but some are .75 and .50 towards maturity, while no young blues show.

Forehead: Few blues appear to be seen among the greys.

Cheeks: Browns new and developing, and about equal to the old blues remaining.

Neck: Black collar distinct, young “browns” showing beneath.

Mantle: Approx. 50% of browns and blues. The “browns” look new, while more are maturing below.

Throat: Browns are and have lately matured here.

Wings: The sixth primary on each is half its normal length.

Abdominal region has the feathers creamy white, between youth and old age.

Tail: There is a new set breaking from its sheaths, and now peep beyond the upper coverts.

Bill, black.

The "winter browns" are coming all over the body, and excepting the doubtful feathers of the forehead the bird is a thorough moult of its blues and blue-blacks.

Specimen 5.—Adult male, more than 3 years old, 20/4/98. This skin is apparently one of those that attain their nuptial plumage in autumn, as the back, neck and throat shew all the brown feathers to be old. About 75% of the blues of the body are now shown, and are new, while the remaining 25% are appearing to view beneath the plumage.

Cheeks: Blues coming and matured; no browns.

Forehead and crown: Blues in large quantity bursting into full feather; no browns.

Neck: Blacks are quite new, in different stages of growth.

Mantle: Blues in large quantity bursting into bloom.

Back: New blacks appearing; "browns," old.

Lower chest and abdominal feathers are fairly white.

Secondary quills have the margins of the outer webs washed with blue; (sign of old age.)

Specimen 6.—Adult male (approx. 3 years' old), 23/3/99. Of twenty skins in my cabinet that are in semi-liveried plumage this is the only one that presents a problem to us, for it is gaining new "blues" and "browns," and has some of the black-collar feathers crescently tipped with brown. As the blues and blacks predominate, it appears to me as a bird trying to attain its nuptial plumage in autumn as is customary with a small percentage.

Complement of "blues" are near 60% of spring plumage.

Forehead and crown show new "blues and browns."

Cheeks: New "blues and browns;" the blues in the majority.

Neck: Blacks coming in large numbers with two or three "browns."

Mantles: "Blues" seem old; browns are coming while some appear aged.

Throat and upper breast: Both "blue-blacks and greyish-whites" are new, the greys being in the minority.

Back: The black plumage is new.

Feathers of abdomen: Creamy white.

Secondary quills have not attained the bluish-green wash; fifth, sixth, and tenth wing quills not yet developed.

Tail : Deep-blue (new.)

The autumn plumage will be disfigured by "browns."

Specimen 7.—Adult male (approx. 3 years old), 24/8/97. Dorsal plumage brown with heavy outcrops of blue-black, and a few signs of coming "blues." Tail, deep-blue ; abdomen, a fairly clear white ; and secondary quills without any greenish-blue. These three characters help to indicate the age. This bird has simply to throw off a mass of "brown," and it will appear in all its glory.

Specimen 8.—Adult male (more than 3 years' old), 27/8/96. It is much like the skin of 24/8/97. The outer webs of the secondary quills shew only a faint trace of blue on two of them. It is not so mature a bird as those of 20/4/97 and 24/8/97.

Specimen 9.—Adult male (more than 3 years old), 4/5/98.

Head : Only a few "browns" remain, and "blues" are still bursting, especially from the forehead.

Mantle : "Blues," about equal with the "browns," but these are maturing blues beneath the surface.

Throat : "Blue-blacks" have appeared ; only four "browns" remain, and this is the first part to arrive at maturity.

Cheeks have nearly all their "blues."

Nape : The blacks are hidden by the browns, but beneath they are in evidence.

Secondary quills show their outer edges to be washed with faint blue ; not so distinctly as in the skin of 24/8/97, but more so than in that of 27/8/96. Tips of quills tend to whiten ; both autumn and spring quills in these fully matured birds show this.

Abdomen is clear white ; flanks have many browns still to fall.

Tail : Deep blue.

This is the blue-wren so many of us see in the winter—the so-called scarce bird—as it comparatively is.

Specimen 10.—Adult male (more than 3 years' old), 20/4/97. Almost in full livery.

Forehead, crown, mantle and cheeks : Blues still coming ; while two large brown feathers still remain as evidence of a former plainly dressed stage.

Throat : This region shews the last of the blue-blacks bursting in the season.

Secondary quills edged with greenish-blue, not as intense as that of 24/8/97, but on a par with that of 4/5/98.

Tail : Deep blue with some pure white tips.

Specimen 11.—Adult male (well-up in years), 24/8/27. Apparently in full nuptial plumage, crown of head and mantle ; some few blues are still maturing and lie hidden. A pectoral dense black narrow line shews as a septum between the blue-black of the lower throat and the lower chest white. Abdomen and flanks are whiter than in the majority of specimens.

Secondary quills : The edges of the outer webs shew greenish-blue more prominently than in any of the other specimens examined. The tips are terminated with white.

Tail : Deep blue.

In a letter to me, dated 13th March of this year, Mr. Graham writes of capturing three fine specimens of male birds which showed tails having feathers of various lengths now coming, and new "quills" with shafts of grey shewing out amongst the old "blacks and blues." Unfortunately these turned into a decomposed state owing to the very hot weather, and were not preserved. This is apt to make one think the "blue birds" are not such rare autumn monitors of the "browns" as I have been partly influenced to believe by my deductions from the numbers of blues in the Heytesbury. I say the Heytesbury, because I have put great faith in Mr. Graham's keen and extensive observation.

The moults of the female bird are not so striking as those of the male, because the tail and lores are about the only colored parts that attract one's attention for purpose of recognition. The young females start the change of colour of bill, from nutty brown to black, in September, as well as the tail from brown to blue. Both these parts also change in April—May. The young of December would make very slight change before the spring, but it would be more definite in April and settled by the following spring. Considering the large number of female wrens relative to the small quantity of nests (keenly hunted for), it appears to me as likely the young female may pass the first year without breeding.

A. Female nestling, December brood : Lores, light ; Chest, nutty brown ; tail, brown.

B. Young female, 1/4/99. The skin shows advance of winter plumage.

The lores and anterior orbital feathers are reddish, as in adult female.

Bill: Usual chocolate color of female wrens. The tail quills are brown with a faint trace of blue, as those of a bird that is now making its second or third moult. Judging by tails examined, I should say the blue wren does not carry the original tail during the first year like many birds, but sheds it just before the first autumn in favor of a longer and stronger one. The Gallinæ drop the original quills before they are one-third grown. Above these, new feathers are half-way along the tail and colored a light blue distinct from the others, and not nearly so blue as the next and older stage. Dorsal plumage greyish-brown, lighter than C.

C. Adult female, August. Tail: Deep blue. Dorsal surface ruddy brown and darker than in B.

In examining six skins of *M. cyaneus*, I find one is actively moulting its "blues" and receiving "browns" on Jan. 26. The remaining five simply show the "blues" coming in spring time, but they all (except one) shew unmistakable evidences that they are not receiving "blues" for the first time. They are simply parallel cases to those of *M. gouldii*, but instead of my obtaining them in late summer I have collected in late winter.

Specimen 1.—Male, 26/1/98. Approx. .20 of the "blues" on the mantle and .50 on the head. No new "blues" or "blue-blacks" appearing. Crown and nape show new "browns" coming, and new "browns" almost matured; few blues remaining.

Mantle: New and almost fully matured browns.

Back shows new "browns."

Throat: All the new feathers are greyish-white, many showing above the "blue-blacks."

Tail: A new set of deeper blue feathers are .75 developed; the others still remain.

Bill: Brownish-black; between 1—3 years. This seems to me an early moult, but as the summer of 1898 was early, and the hottest for thirty years past, the bird may thus have been the recipient of an early moult.

Specimen 2.—Young male, about 9 months' old, 4/8/94.

Bill, lores, legs and feet chestnutty brown.

Tail : Blue.

This is evidently a bird from the last season's nest.

Specimen 3.—Adult male, 31/7/96.

Lores black of adult and not brown of youth or winter plumage.

Bill : Black.

Tail : Feathers blue.

Upper surface brown, under surface whitish. Although, adult, this is not an aged bird.

Specimen 4.—Adult male, 11/9/97.

Lores : Brown, with one or two blacks peeping through.

Blues and blue-blacks generally coming.

Tail : New feathers deep blue.

Specimen 5.—Adult male, 16/7/96. Bill, black ; tail, deep blue. "Blues" nearly fully arrived to form mantle.

Specimen 6.—Adult male, 17/7/96. Approaching full nuptial plumage, with many new "blues and blue-blacks" developing. The tail is so deeply blue and the lower chest so clear white that I have no doubt it is more than two years' old.

Other male birds of this species I find to be approaching "full livery," are dated—

<i>a</i> '	-	-	17/7/96.
<i>a</i> "	-	-	9/8/94.
<i>a</i> "	-	-	16/10/97.

The moult for the year in others was completely finished in—

<i>b</i> '	-	-	18/8/94.
<i>b</i> "	-	-	25/9/97.
<i>b</i> "	-	-	16/10/97.

C. *Male Wren under Domestication.*

To try and rear wrens in ordinary aviaries means a chapter of accidents. Even in the exact haunt of the birds Mr. Graham had trouble, for he writes: "After many fruitless attempts to rear the young birds I decided to let the old ones do the rearing. To this purpose I made four large cages, and installed a nest of young birds in each. This answered very well, for, food being abundant, the young were kept well supplied through the wire of the cages, until a succession of cold nights ended the experiment by killing the young birds to the last one." They needed the warmth and break-wind of the parent.

On 12/7/98 Mr. Graham caged a wild bird. "No change was observable in its condition until 13th October, when a small speck of blue appeared below the left cheek. On 25th October I noticed new blue feathers under old greys. I took the bird in my hands and found a few blacks and blues sprouting beneath greys. On 11th November new tail feathers pushed out. Two upper tail feathers fell out on the 14th. On 25th new blues appeared budding on head and around upper mandible; bill growing darker in colour. Black or sombre colour on cheeks have taken the place of rufous. By 6th January the two upper tail feathers seemed to have attained full length. On 20th January some wing feathers fell out; nothing further of note until 28th February, when several tail feathers fell out; breast greys began to fall and moulting seemed rapid. New browns are "bursting." Two more tail feathers fell out on 18th March. From 20th to 26th March several wing feathers fell, and all trace of blues disappeared from above bill and around head. Last two old tail feathers fell out on 28th March while two new ones were coming in their place; few body feathers still falling. Few greys and blues still falling on 2nd April. At the present time (3rd April) it has all the appearance of old males in the bush, *e.g.*, grey body, blue tail, and a bill gradually getting blacker. Although it did not get properly through its most important moult (spring), and attain a full livery, it came out true to the autumn moult. Its failing to develop a full crop of blues and blacks and to discard its winter plumage at the proper time (November, or earlier) was due, perhaps, to want of proper food, variety in diet, unfavourable conditions as to sunlight and exercise, or something we do not know of.

"As to food supplied—quantity, preference, etc., from July to 1st January, grubs,¹ with a little finely chopped meat, bread-crumbs, small beetles and caterpillars, formed the bulk of its food. It generally managed to dispose of sixty grubs, about a dozen small insects, and a small portion of bread and meat, sufficient to equal the bulk of 100 grubs, as named above, per day. From 1st January to 1st April, grasshoppers have formed the staple, varied with March-flies and cockroaches. The quantity devoured amount to about the same as with the

¹ Mr. C. French, F.L.S., has kindly identified these for me as the larvæ of a species of *Anoplognathus*.

grubs, viz., 100 per day, and the immature form of the great green grasshopper is preferred to all other kinds of food I have given to it. Moths, March-flies and small winged insects are greedily devoured; in fact it can 'stow away' four large blow-flies on a fairly full stomach."

I have not been able to go so thoroughly into the subject as would have brought out more facts in this essay as well as have taken from it some week points; but having ascertained the facts enquired for and of most importance, I now use the opportunity of the close to a season to record the above notes on the natural history of the Maluri.
